

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

DANIEL A. JAPUNTICH ET AL.

Group Art Unit: 3761

Serial No.: 08/240,877

Filed: May 11, 1994

Examiner: A. Lewis

For: UNIDIRECTIONAL FLUID VALVE

AFFIDAVIT OF FRANK J. FABIN

I, Frank J. Fabin, being duly sworn, state as follows:

1. I presently hold the position Technical Manager for the Respirator Systems Business Unit of the Occupational Health and Environmental Safety Products Division (OHESD) at the 3M Company, St. Paul, Minnesota.

2. I received a Bachelors of Science degree in mechanical engineering from the University of Maryland in 1970. I also have received a Masters of Business Administration from the University of St. Thomas, St. Paul, Minnesota, in 1979.

3. I began work for the OHESD in 1977 as an engineer in division engineering. From 1981 to 1991, I worked in product automation and new product development for OHESD. During the period of 1990 and 1991, I was the action team leader for the development of an exhalation valve that resulted in an invention that is the subject matter of the above-captioned patent application. Before being the action team leader for this valve development assignment, I was also on the product development team for the respirator valve that was the subject of U.S. Patent 4,934,362 to Braun. From about 1992 to present, I have been the Technical Manager for the Respirator Systems Business Unit of the OHESD. In this capacity, I have overseen the development of positive pressure respirators and elastomeric face pieces and the components that are used on these products, including exhalation valves.

4. I have obtained about 4 issued U.S. patents for the OHESD since I began employment with this business unit.

5. I am familiar with the subject matter of U.S. patent application Serial No. 08/240,877.

EXHIBIT D

6. I understand that the Examiner has held the subject matter of claim 78 to be unpatentable based on the disclosures in U.K. patent application GB 2072516A to Simpson et al. (Simpson) and U.S. Patent 3,191,618 to McKim. I understand that the Examiner has concluded that "[i]t would have been obvious to modify the flexible flap and seat of Simpson et al. (fig. 2) to be curved because it would have provided for quick effective seating without float or bounce after each opening as taught by McKim (col. 1, lines 64-72)."

7. I have reviewed the Simpson and McKim patent disclosures, and I do not believe that a person of ordinary skill in the filtering face mask art would have combined the teachings of these references. I do not believe that a person of ordinary skill would be motivated to look at references in the valve art for gasoline engines for solutions to problems confronted in the filtering face mask field or the exhalation valve art field. I further do not believe that the subject matter of the McKim patent is pertinent to the subject matter described in Simpson. Nor do I believe that the McKim disclosure is pertinent to the subject matter sought to be patented in the above-captioned U.S. patent application Serial No. 08/240,877.

8. My review of the McKim patent reveals a curved seat reed valve that is suitable for use in high rpm two-cycle engines. The reed valve comprises a thin, normally flat, single thickness, springy, sheet material, which, when relieved of external stresses will lie flat, but which is flexed lengthwise to define a curve. The reed valve is disclosed to be made of a spring sheet material, such as, for example, shim stock. The reed valve is disclosed to bear throughout its length against a valve seat, with the seating bias at the free end of the reed being as great as, or greater than, that throughout the remainder of the reed. The reed valve is indicated to be designed to seat quickly, effectively, and without float or bounce after each opening. The patent indicates that the reed valve is adaptable for use within an extremely high-speed engine, for example, one that will turn at a speed on the order of 10,000 or 12,000 revolutions per minute or at more modest speeds of 5,000 to 6,000 rpms.

9. In my approximately 24 years of working in occupational health, I have not — nor am I aware of another person who works in this field who has — consulted a reference in the reed valve art for gasoline engines to obtain solutions to problems encountered in developing exhalation valves that are used on filtering face masks.

10. Filtering face masks possess the problem of creating a warm, moist, high CO₂ content environment around the nose and mouth of a person who wears a filtering face mask. Investigators in this field have pursued a goal of purging from the mask interior the largest amount of fluid possible while using the least amount of energy. Investigators therefore have pursued the particular goal of designing exhalation valves that open easily in response to the exhalation pressure developed in the mask interior during an exhalation. Exhalation valves that open under minimal pressure allow the warm, moist high CO₂ content air, to be more easily removed from the mask interior and thus require the wearer to expend less energy to operate the valve over an extended period of time. Exhalation valves typically operate under ambient environmental conditions in response to exhalation pressures generated by the wearer. These conditions are remarkably different from the environment (for example, temperatures and pressures) under which a reed valve operates in a two-cycle gasoline engine. The flexible flaps that are used in exhalation valves do not deal with problems of float, or flutter from bounce in closing like the reed valves described by McKim. The opening and closing of an exhalation valve occurs in cadence with a wearer's breathing pace, which is orders of magnitude less than the high rpms under which gasoline engines operate at. For these reasons and others, persons of ordinary skill in the filtering face mask and exhalation valve art, as far as I am aware, do not examine documents that pertain to reed valves for two-cycle gasoline engines in designing filtering face masks and the exhalation valves that are used on them. Documents that describe reed valves for two-cycle gasoline engines are not in the field of endeavor of persons who design exhalation valves for filtering face masks.

11. The present invention was concerned with providing a filtering face mask that would not allow contaminants to enter the interior of the mask through the valve and would, at the same time, be comfortable to the wearer by displacing as large a percentage of exhaled air as possible through the exhalation valve with minimal effort. The present invention is concerned with "(1) minimizing exhalation pressure inside a filtering face mask, (2) purging a greater percentage of exhaled air through the exhalation valve (as opposed to having the exhaled air pass through the filter media), and under some circumstances (3) providing a negative pressure inside a filtering face mask during exhalation to create a net flow of cool, ambient air into the face mask." The art of reed valves for gasoline engines is not a source, to my knowledge, that has ever been consulted by persons who develop filtering face masks and the exhalation valves that are used on them. Nor

to my knowledge has the art for reed valves for gasoline engines ever been consulted to deal with the nature of the problems that were attempted to be solved by those who develop exhalation valves for filtering face masks. I am not aware of one instance where persons of ordinary skill in the filtering face mask or exhalation valve art has found reed valves for gasoline engines to be reasonably pertinent to problems that they encounter in the development of these products. In all of my years of working in this field, and in supervising others who work in this field, I have not seen one instance where a reference to a reed valve for a gasoline engine has been one that would have logically commended itself to the attention of an investigator in the field of developing filtering face masks or exhalation valves or would have been consulted to overcome problems that are confronted in the design of such products.

Frank J. Fabin
Frank J. Fabin

Subscribed and sworn to before me
this 10th day of December, 2001.

Susan M. Dacko
Notary Public

